

WHAT IS CLAIMED IS:

- 1 1. A system comprising:
2 a first robotic arm assembly for capturing and releasing a semiconductor wafer, the
3 first robotic arm having at least two degrees of freedom;
4 a second robotic arm for capturing and releasing an interleaf, the second robotic arm
5 having at least two degrees of freedom; and
6 a controller for actuation of the first and second robotic arms, the first and second
7 robotic arms operating substantially simultaneously.
- 1 2. The system according to claim 1 wherein the second robotic arm comprises:
2 a transfer arm having a first end and a second end, the arm being mounted to a second
3 arm base;
4 a counterweight attached to the first end of the transfer arm; and
5 an end effector attached to a lower portion of the chuck assembly.
- 1 3. The system according to claim 2 wherein the end effector is configured to apply
2 variable pressure forces to capture and release the interleaf.
- 1 4. The system according to claim 3 wherein the end effector is configured to
2 sequentially apply negative and positive pressures to capture and release the interleaf.
- 1 5. The system according to claim 3 further comprising a sensor to detect a proximity and
2 engagement of the interleaf with the end effector.
- 1 6. The system according to claim 5 wherein the sensor uses differential pressure,
2 reflectance, imaging, capacitance or inductance to detect proximity and engagement of the
3 interleaf.
- 1 7. The system according to claim 3 further comprising a sensor to detect the material
2 properties of the interleaf.
- 1 8. The system according to claim 7 wherein the sensor uses differential pressure,
2 reflectance, imaging, capacitance or inductance to detect the material properties of the
3 interleaf.

- 1 9. The system according to claim 3 wherein the end effector arm further comprises
2 electrodes to provide an electrostatic charge for capturing the interleaf.
- 1 10. The system according to claim 2 wherein the end effector is slidably disposed in a
2 substantially vertical orientation at the second end of the transfer arm.
- 1 11. The system according to claim 10 wherein the end effector is configured to vertically
2 actuate independently of the base.
- 1 12. The system according to claim 1 wherein at least one of the robotic arms is
2 pneumatically actuated.
- 1 13. The system according to claim 1 wherein at least one of the robotic arms is actuated
2 with electric servo motors.
- 1 14. The system according to claim 1 comprising an interleaf cassette holder including a
2 pneumatic separator for separation of the interleafs.
- 1 15. An assembly comprising:
2 a transfer arm having a first end and a second end, the arm being mounted to a second
3 arm base;
4 a counterweight attached to the first end of the transfer arm;
5 a chuck assembly attached to the second end of the transfer arm; and
6 an end effector attached to a lower portion of the chuck assembly, the end effector
7 configured to apply positive and negative pressures to a substrate.
- 1 16. An assembly according to claim 15 wherein the end effector is configured to
2 sequentially apply positive and negative pressures to the substrate.
- 1 17. An assembly according to claim 15 further comprising a sensor to detect the material
2 properties of the substrate when coupled to the end effector.
- 1 18. A method comprising:

2 providing a processing system having first and second robotic arms, the first robotic
3 arm having a first end effector for capture and release of a semiconductor wafer, the second
4 robotic arm having a second end effector for the capture and release of an interleaf sheet;
5 positioning the second robotic arm such that the second end effector is proximate to
6 interleaf sheets;
7 applying a positive pressure through the second end effector to the interleaf sheets to
8 separate an upper-most interleaf sheet from remaining sheets;
9 applying a negative pressure through the second end effector to retain the upper-most
10 interleaf sheet against the second end effector; and
11 transporting the upper-most interleaf sheet from a first location to a second location;
12 and
13 releasing the upper-most interleaf sheet from the second end effector.

1 19. The method according to claim 18 wherein the interleaf sheet is released into a
2 enclosure and further comprising positioning the first robotic arm for capturing the
3 semiconductor wafer from a first location and releasing the semiconductor wafer to a second
4 location within a wafer shipper before each release of the upper-most interleaf sheet from the
5 second end effector.

1 20. The method according to claim 19 further comprising capturing the semiconductor
2 wafer by applying negative pressure through the first end effector and releasing the wafer by
3 applying ambient pressure through the first end effector.

1 21. The method according to claim 18 further comprising reading a wafer ID for
2 complete wafer tracking from the first location to the second location.

1 22. The method according to claim 18 further comprising storing and sending data for
2 label printing of the semiconductor wafer with a label printer.

1 23. The method according to claim 18 further comprising inspecting the semiconductor
2 wafer for defects such as edge damage.

1 24. The method according to claim 18 further comprising sorting the semiconductor
2 wafers into a plurality of second locations.